CLAIMS

1. A signal processing apparatus comprising a plurality of receiving means arranged to receive a composite signal indicative of a plurality of symbols transmitted, substantially simultaneously, from a plurality of remote transmission means, and processing means arranged to iteratively decode each most probable symbol contained in said composite signal, within a constrained enumeration formalism.

2. Apparatus according to Claim 1 wherein the processing means is arranged to define an enumeration constraint for use in the constrained enumeration formalism.

3. Apparatus according to either of Claims 1 or 2 wherein the processing means is arranged to perform a QR decomposition upon a channel gain matrix.

4. Apparatus according to Claim 3 wherein the enumeration constraint is a number of entries in an **R** matrix over which probable symbols are enumerated.

5. Apparatus according to any preceding claim wherein the processing means is arranged to determine the most probable symbol by enumerating across all symbol conditional probabilities for each possible symbol.

6. Apparatus according to Claim 5 wherein the processing means is arranged to convert symbol conditional probability to a bit level logarithmic likelihood ratio (LLR).

7. Apparatus according to any preceding claim including a parallel to serial conversion means arranged to convert parallel, bit level, LLR's into a single stream of LLR's.

8. Apparatus according to Claim 7 including a deinterleaving means arranged to deinterleave, bit level, LLR's from the single stream of LLR's.

9. Apparatus according to any preceding claim including decoding means arranged to apply iterative soft input soft output (SISO) decoding to single bit LLR's to determine a symbol.

10. Apparatus according to Claim 9 wherein the decoding means is arranged to pass a symbol probability to the processor for inclusion in an iterative enumeration step.

11. Apparatus according to either of Claims 9 or 10 including a hard decision unit that is arranged to determine a symbol based upon a soft output from the decoding means.

12. A method of signal processing for a MIMO system comprising the steps of:

i) receiving a composite signal indicative of a plurality of symbols;

ii) performing a **QR** decomposition upon a channel gain matrix for the composite signal;

iii) defining an enumeration constraint;

iv) calculating possible conditional probabilities for one of the plurality of symbols contained within the composite signal, using the enumeration constraint; and

v) iterating step iv), incorporating a most probable symbol for the one symbol determined in the previous iteration of step iv) in the conditional probability calculation operation.

13. A method according to Claim 12 including setting the enumeration constraint to encompass a sub-set of possible transmit antennas.

14. A method according to either of Claims 12 or 13 including defining the enumeration constraint as a number of elements within an **R** matrix.

15. A method according to any one of Claims 12 to 14 including calculating a symbol conditional probability in order to determine the most probable symbol received over a given transmission channel.

16. A method according to Claim 15 including converting the symbol conditional probability to a bit level logarithm likelihood ratio (LLR).

17. A method according to any one of Claims 12 to 16 including converting a plurality of parallel streams of bit level LLR's to a serial stream of bit level LLR's.

18. A method according to Claim 17 including deinterleaving bit level LLR's from the serial stream of bit level LLR's.

19. A method according to any one of Claims 16 to 18 including decoding the single bit LLR's.

20. A method according to any one of Claims 12 to 19 including making a hard determination of a received symbol based upon a soft output from the decoding operation.

21. A method of reducing the computational load of a signal processor in MIMO architectures comprising the steps of:

i) receiving composite input signals having spatial diversity from each of a set of n receiver elements;

ii) constructing an n by m channel matrix from values indicative of channel gains between each transmit and receive element;

iii) executing a **QR** decomposition upon the channel matrix to form an upper triangular **R** matrix and a unitary **Q** matrix;

iv) enumerating to determine probabilities of a given symbol being transmitted from a given transmitter using a constrained data sub-set of the triangular matrix; and

v) making a hard decision about which possible symbol is the most probable symbol to have been transmitted so as to reduce the number of enumerations required to carry out a further probability calculation.

22. The method of Claim 21 including using sub-optimally determined symbol values to generate final definite symbol values.

23. A computer readable medium having therein instructions for causing a processing unit to execute the method of any one of Claims 12 to 20.

24. A computer readable medium having therein instructions for causing a processing unit to execute the method of either of Claims 21 or 22.